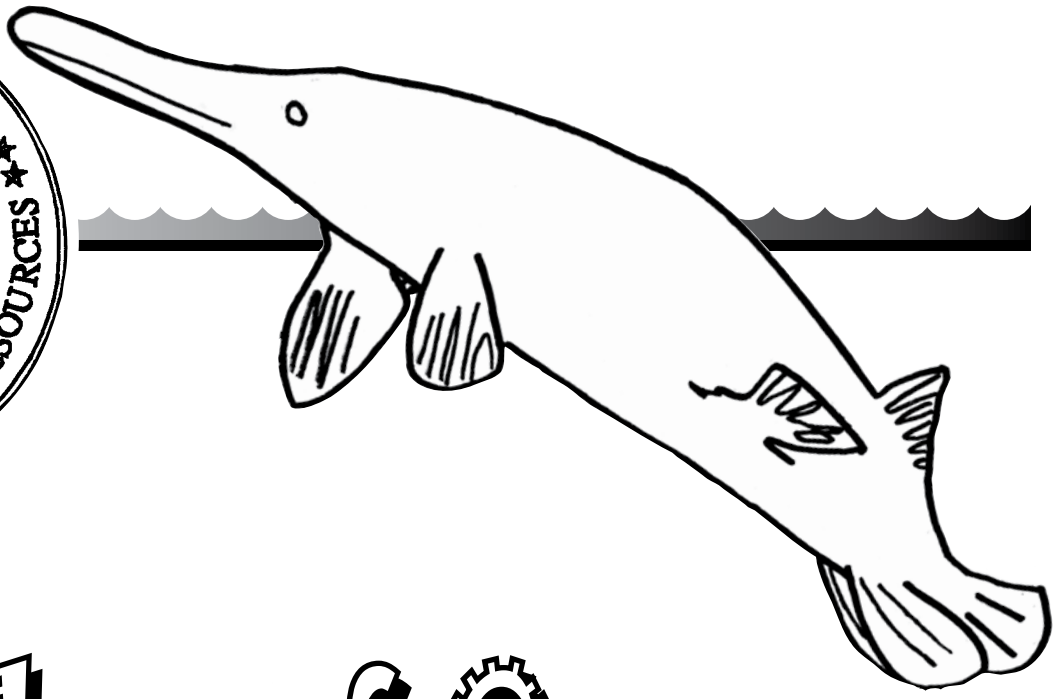
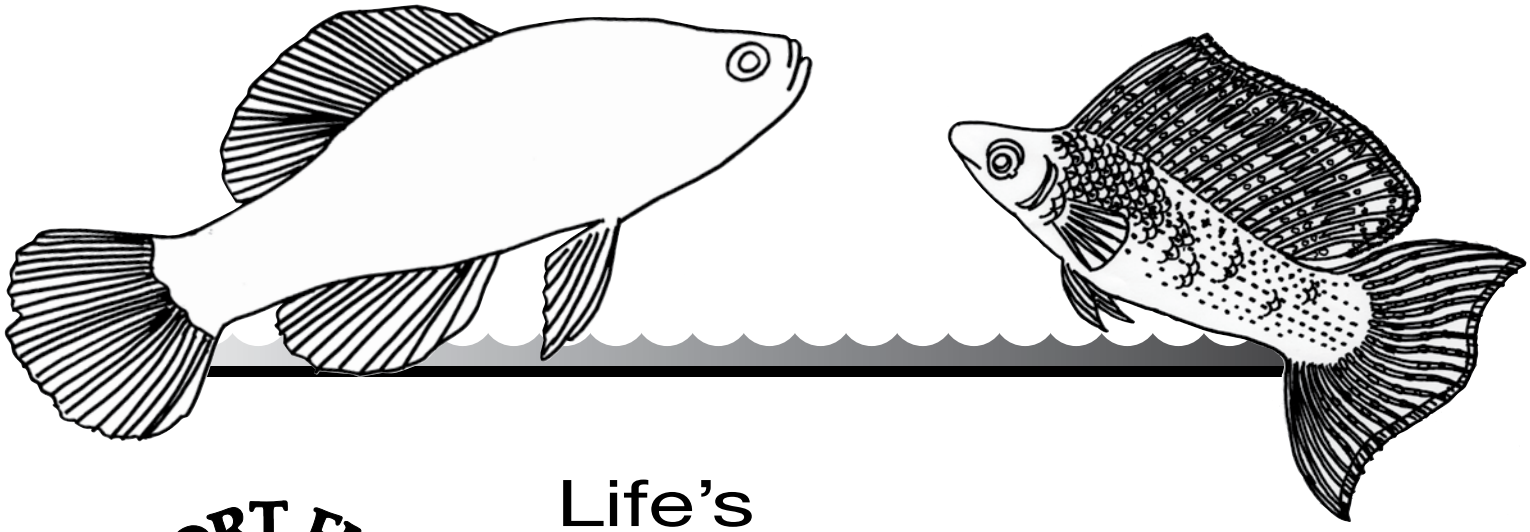
DNR



SC Fishes of Concern Coloring Book



SPORT FISH RESTORATION

Life's Better **OUTDOORS**

South Carolina Department of Natural Resources

www.dnr.sc.gov

SC Department of Natural Resources

The South Carolina Department of Natural Resources is the agency responsible for protecting and managing our state's natural resources. The agency has many workers or employees including wildlife and fisheries biologists who sample, research and develop management or conservation plans to ensure that our natural resources will be around for years to come. In order to create management plans that conserve and protect fish and wildlife, biologists must sample the state's streams, rivers, lakes and land to see what types or species exist in certain locations and estimate their abundance or numbers. This activity book will share some of the fish sampling methods, offer some fun activities and highlight some of the aquatic species of concern. Aquatic species of concern are those species that are rare, threatened or endangered and in need of protection and conservation. To learn more about South Carolina Species of Concern, visit

http://www.dnr.sc.gov/cwcs/index.htm

SOUTH CAROLINA ★★★ DEPARTMENT OF NATURAL RESOURCES

DNR

Sampling Methods

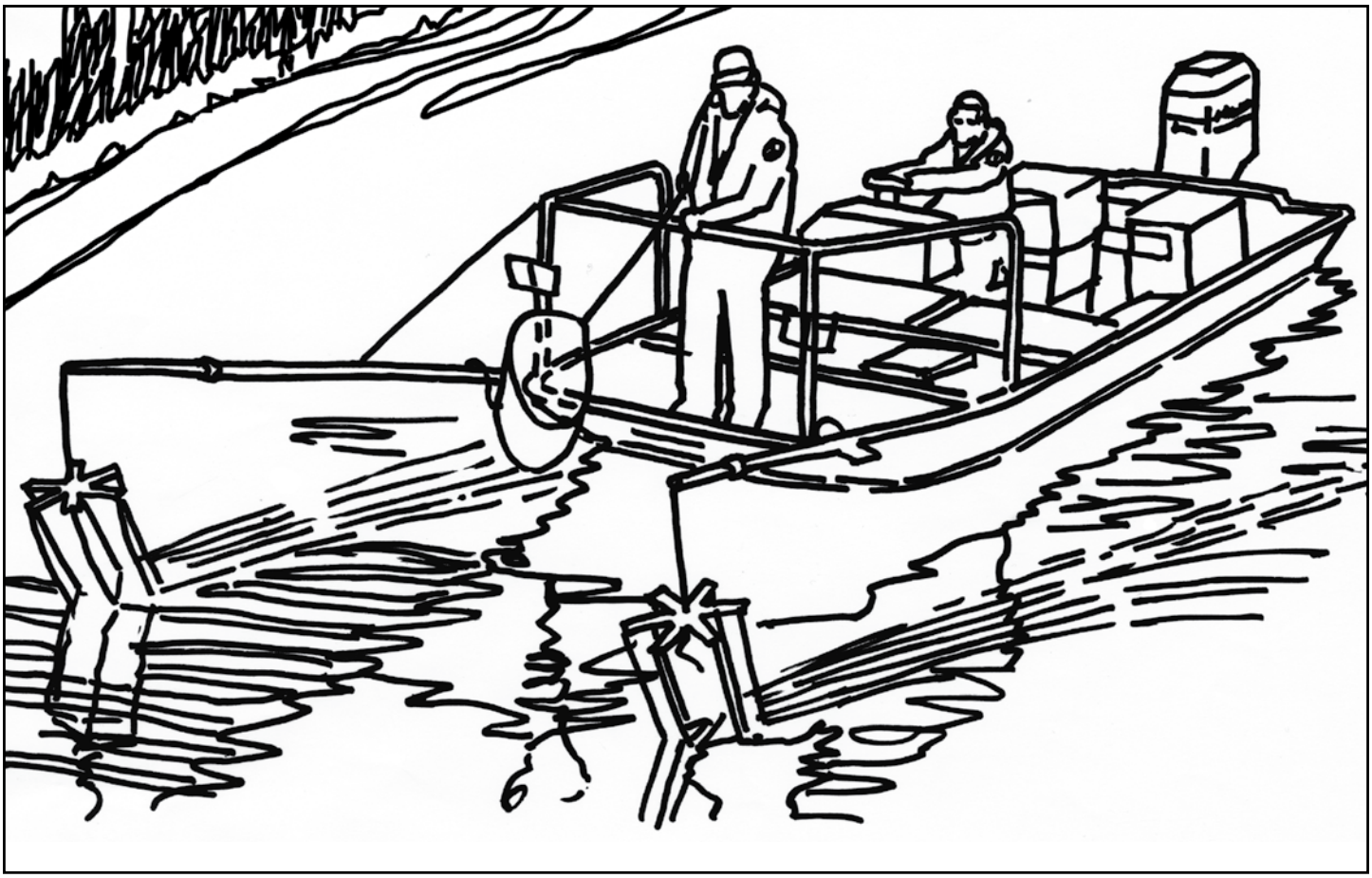
Fish biologists collect fish using several different sampling methods such as dip netting, electroshocking, seining and trawling.

- **Dip Netting** involves using a long handle net along the cracks and crevices in stream banks, fallen trees and aquatic vegetation.

Sampling Methods

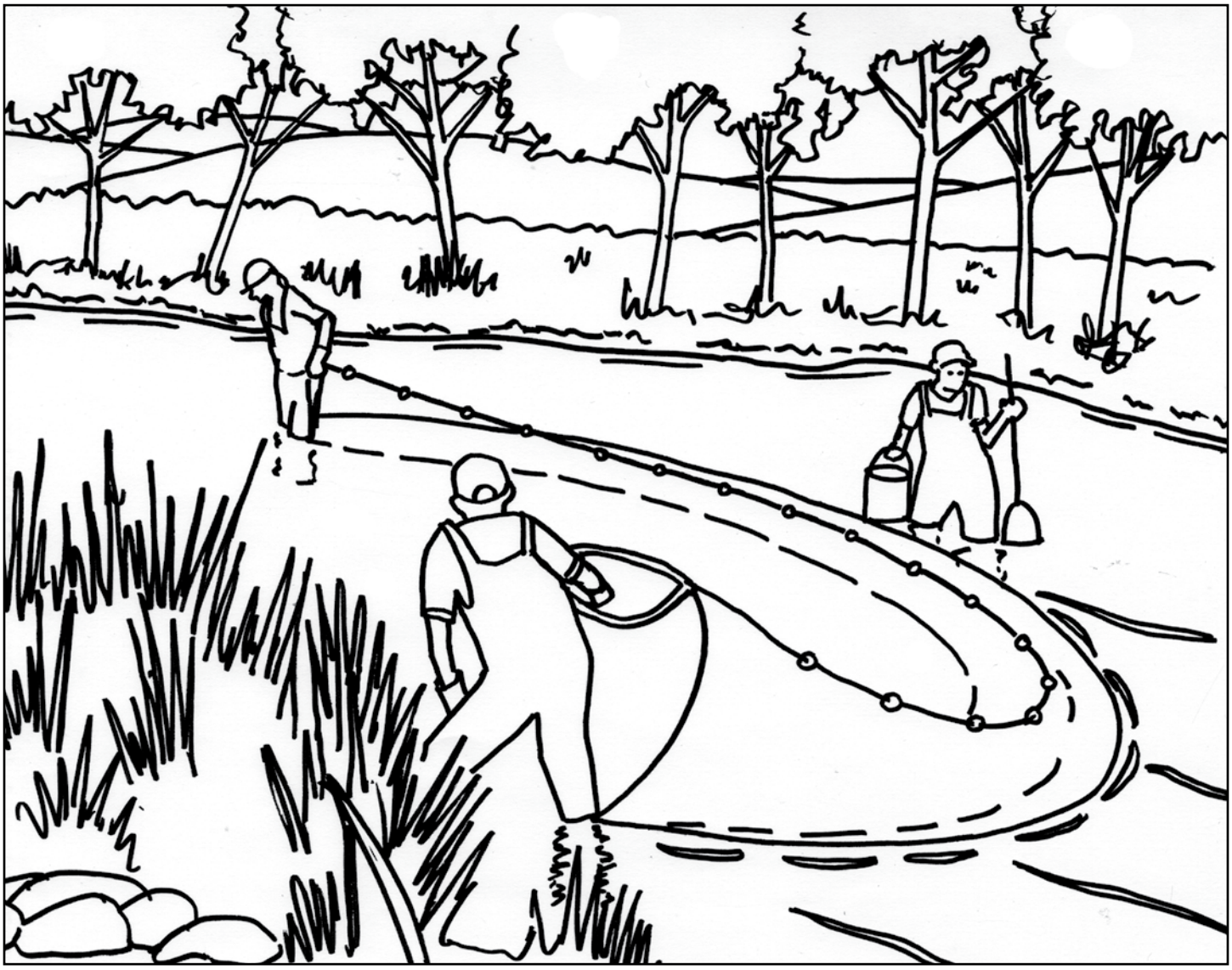
- **Electrofishing** involves carrying a battery powered backpack that sends an electric current through the water that stuns fish for a matter of seconds, allowing the fish to be safely dip netted. Most inland streams are sampled using electrofishing.

Sampling Methods



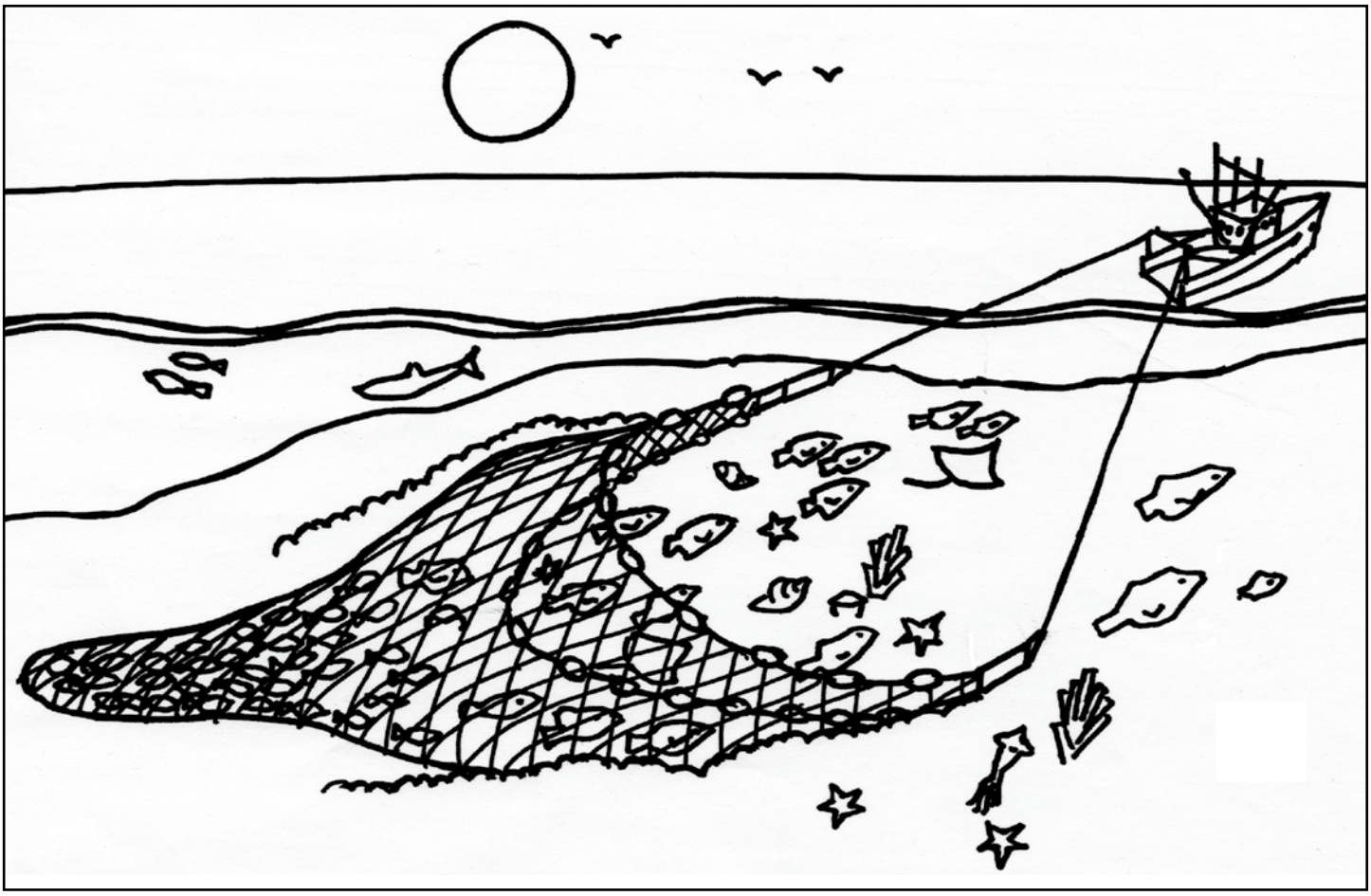
- **Electrofishing** can also be done using a specially equipped boat. The boat electrofishing method is used in large bodies of water such as reservoirs, lakes and rivers.

Sampling Methods



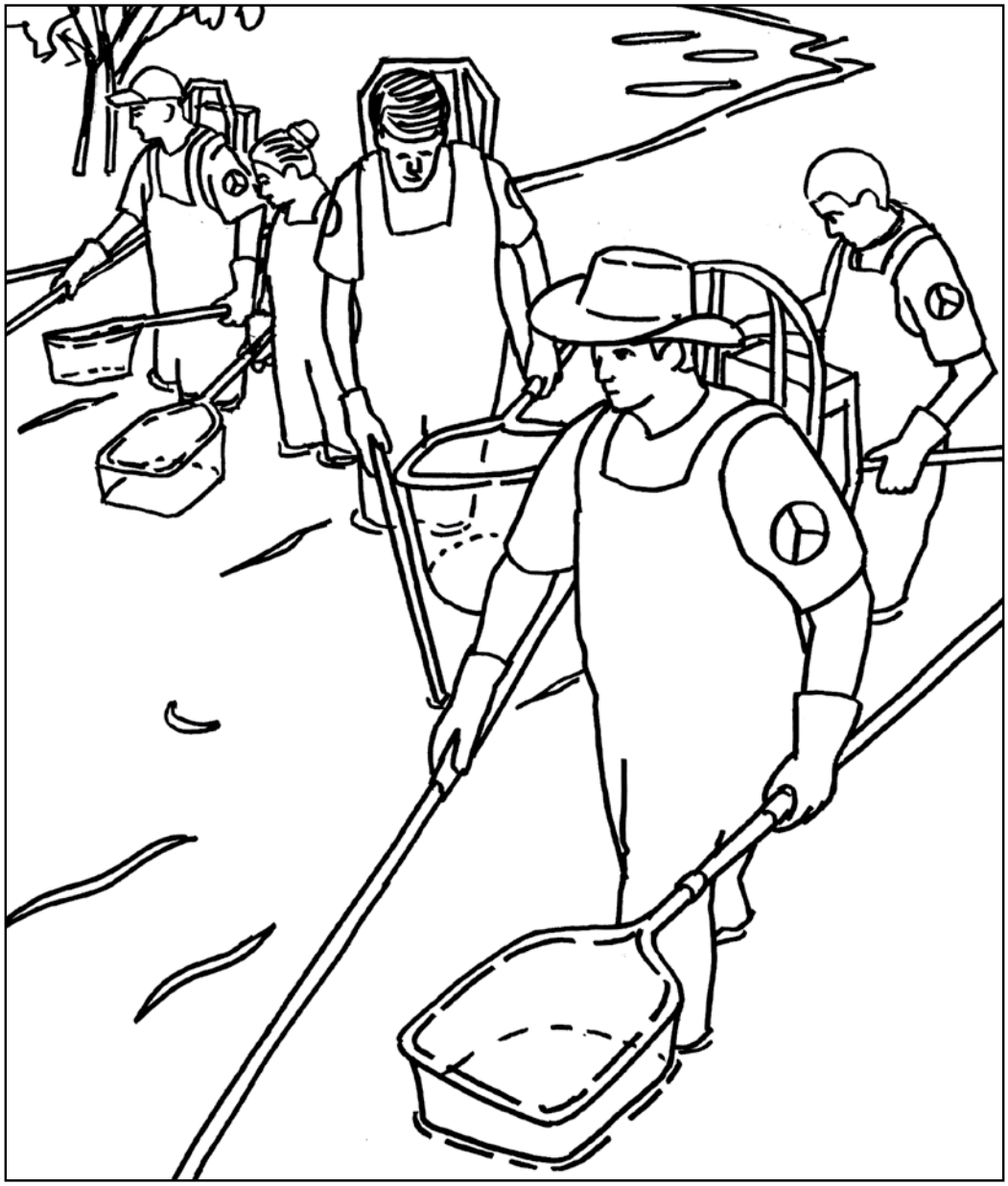
- **Seining** involves using a long net and sweeping it across the bottom of a stream in a horseshoe or half moon shape. The biologists will close the horseshoe or half moon, catching fish along the bottom of the net.

Sampling Methods

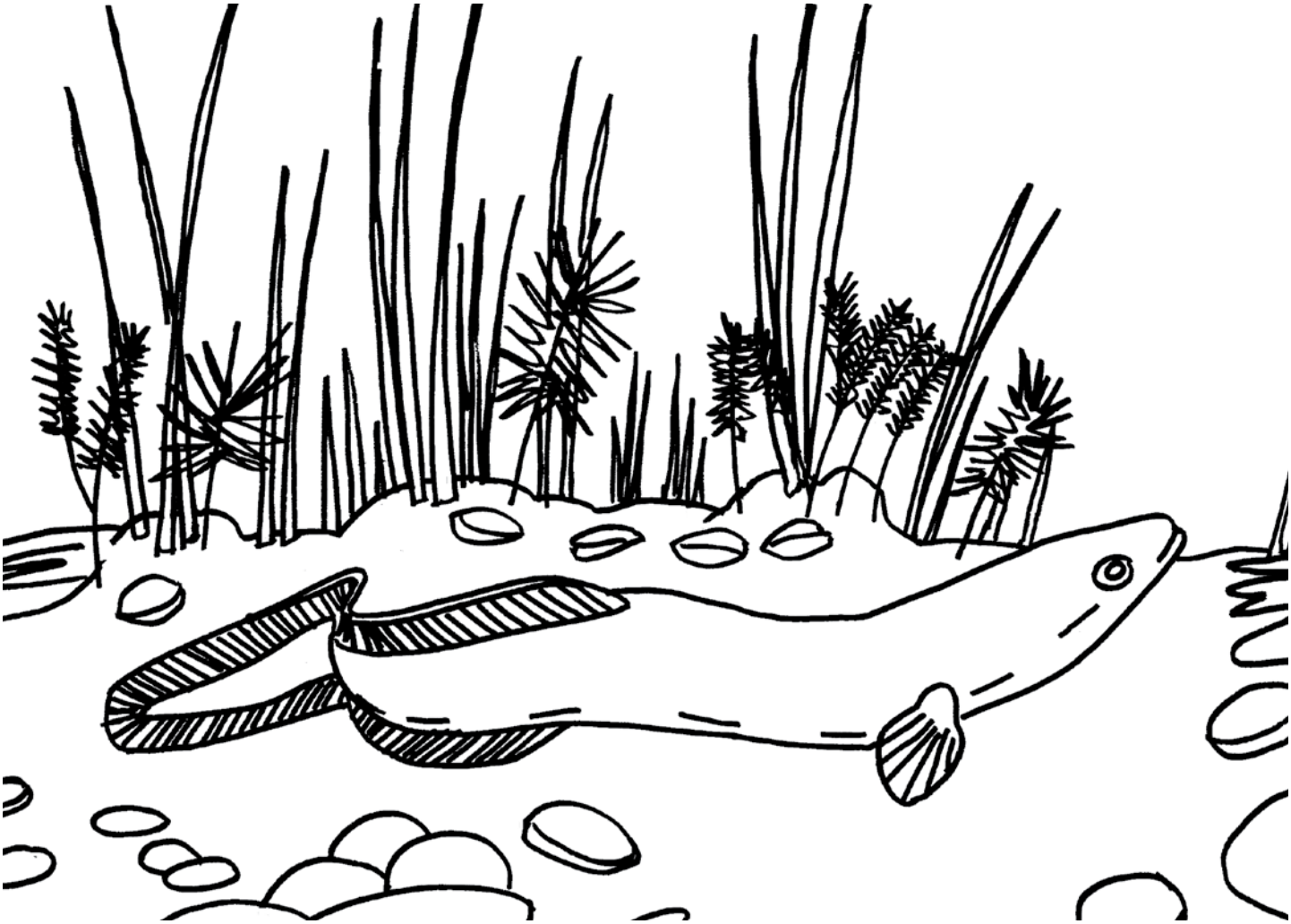


- **Trawling** is similar to seining except that the net is attached to a boat. A net shaped like a sock with a square or triangular opening is attached to the back of a boat. The trawl net (the sock) is lowered into the water and the boat moves forward at a slow speed capturing anything in the net's path. With the help of a winch system, the trawl net is pulled into the boat so that its content can be observed. Trawling is mainly used in the ocean.

Super Stream Team

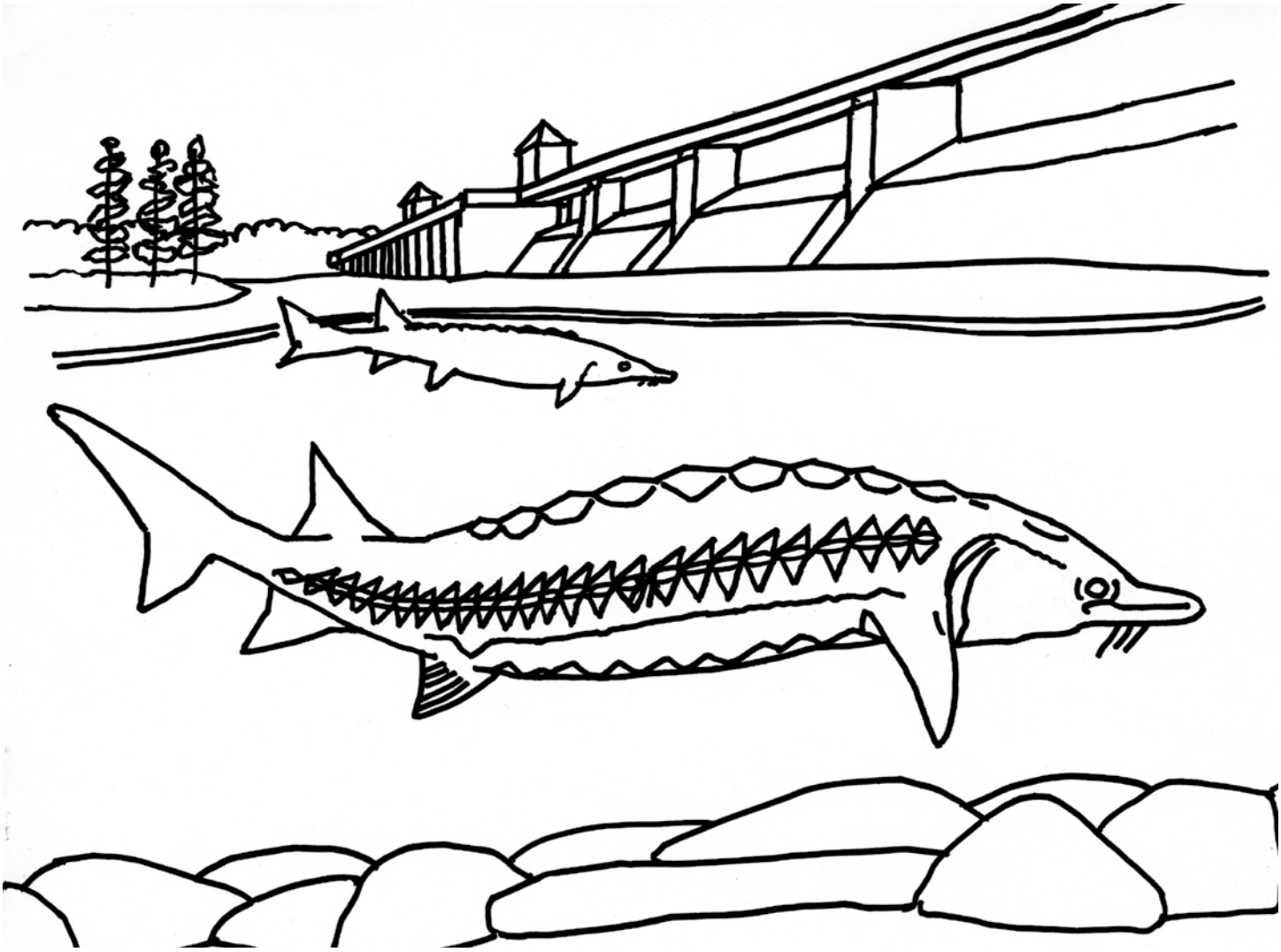


Fisheries biologists work together as the Super Stream Team to sample South Carolina's waters. They measure **diversity** (number of different fish species) and **species richness** (number of fish in a specific area). The Stream Team uses diversity and species richness to look at the health of a stream. They also use the information or data they gather to determine which fish species need **conservation** or protection. The Stream Team gathers information that compares how people use areas near streams and how this use affects or changes the stream quality and habitat for aquatic species. Stream quality can be harmfully affected by many factors such as pollution in the form of excess sewage, fertilizers or litter. Increased amounts of soil or sediments can be introduced into water bodies by dredging, agriculture or logging. This is called **sedimentation** and has a harmful impact on aquatic ecosystems. Now let's look at some of the fish species that the Stream Team may find while out sampling.



American Eel

The **American eel** is a snake-shaped fish, however, it is not a snake. Snakes are reptiles that breathe in air using lungs, whereas eels are fish that breathe using gills and they have fins. Eels have a dark olive, yellowish or slate-gray on the top part of their body and a lighter color below. Eels eat other smaller fishes as well as crayfish, crabs, insects and worms. The American eel is **catadramous**, which means it spawns or lays its eggs in the ocean or saltwater and then lives the rest of its life in freshwater. Barriers such as dams limit the ability of eels to travel upstream to reach areas with suitable habitat and travel downstream to spawn where they grow into adults. Some eels that migrate inland are killed in water intakes and turbines at hydroelectric power plants. Sedimentation is another factor that threatens eels. All types of pollution - from litter to chemicals - can be a problem for the survival of the American eel and other fish.

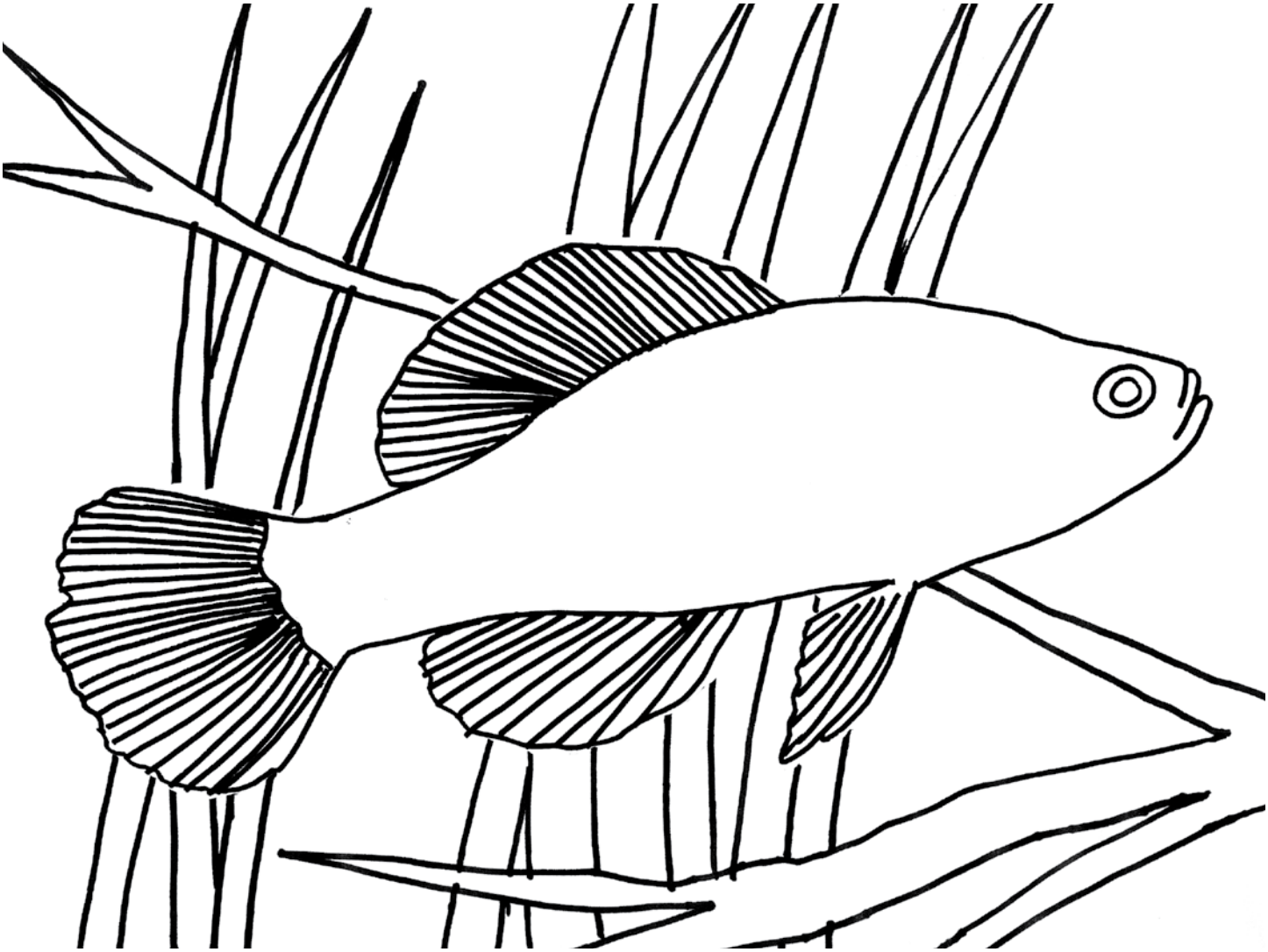


Atlantic Sturgeon

The **Atlantic sturgeon** is shaped like a shark with a dark bronze or brownish color on the top of its body and a lighter color on the sides and white below. It is among the longest-lived fish, living to 50 years old or more. Atlantic sturgeons are also the largest fish that lives in freshwater on the entire Atlantic Coast, reaching lengths of 8 feet and several hundred pounds. Sturgeons eat snails, crayfish, insects and worms. The Atlantic sturgeon is classified as a vulnerable species in South Carolina while its relative the shortnose sturgeon is endangered. Sturgeon are **anadromous**, traveling from the ocean to spawn in freshwater and therefore, are also threatened by barriers such as dams. Dams and hydroelectric power plants also change or alter the natural flow of a water body, hindering the hatching of fish eggs and the ability of young to travel back to the ocean. Just like eels, sturgeons are killed in water intakes and turbines at hydroelectric plants. Other fish species can impact sturgeon as well. Fish that are introduced into areas where they are not supposed to be are called **non-native species**. Sturgeons compete with non-native species such as the flathead catfish which may eat young sturgeon. It is illegal to catch or harvest shortnose and Atlantic sturgeon in South Carolina.

Bluefin Killifish

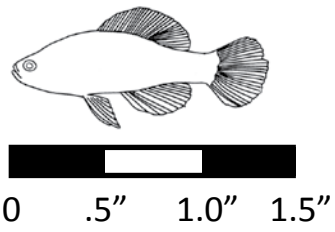
The male **bluefin killifish** have a black stripe that runs from the tip of the fish's nose to the base of its tail with a grayish white body, fins that are blue-edged with black and a patch of red at the base of the tail. Females lack the blue coloration on their fins. Killifish are a type of topminnow, meaning that it lives most of its life near the surface or top of the water. They have excellent eye sight with their eyes positioned upward to the surface. The topminnows are very important for mosquito control, but are sometimes used as fishing bait, too. The bluefin killifish is listed as a species of special concern in North and South Carolina. This fish species is also affected by pollution, sedimentation and changes in the water flow.

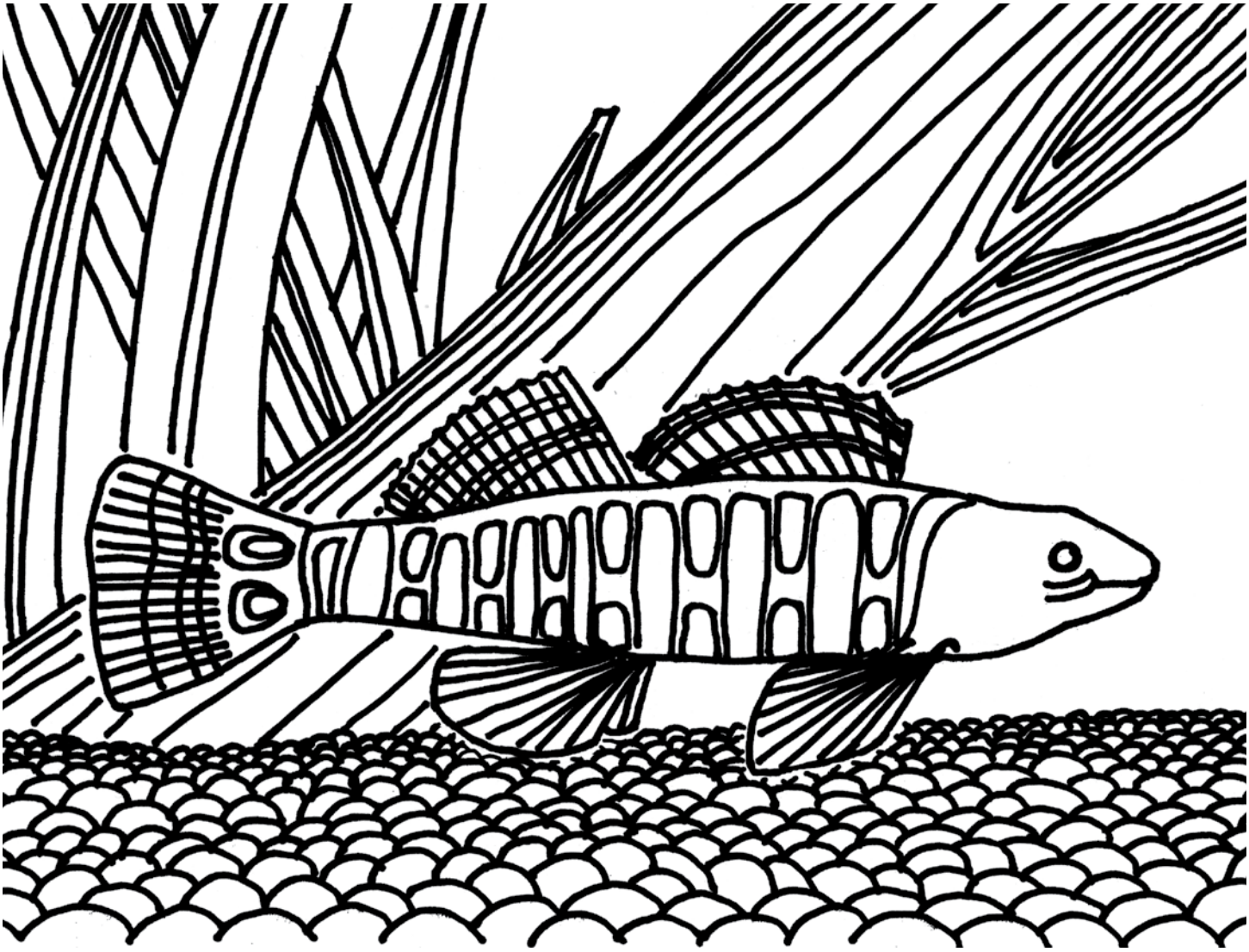


Carolina Pygmy Sunfish

The **Carolina pygmy sunfish** is a very small fish with a maximum length of 1.3 inches. Male Carolina pygmies have blue and black bars along their sides where the female has dark brown and light brown bars. The Carolina pygmy is a federally listed species of concern. This species has a limited distribution, meaning it is found in only a few locations in South Carolina, causing the population to be in danger if there are any changes in their habitat such as development and pollution.

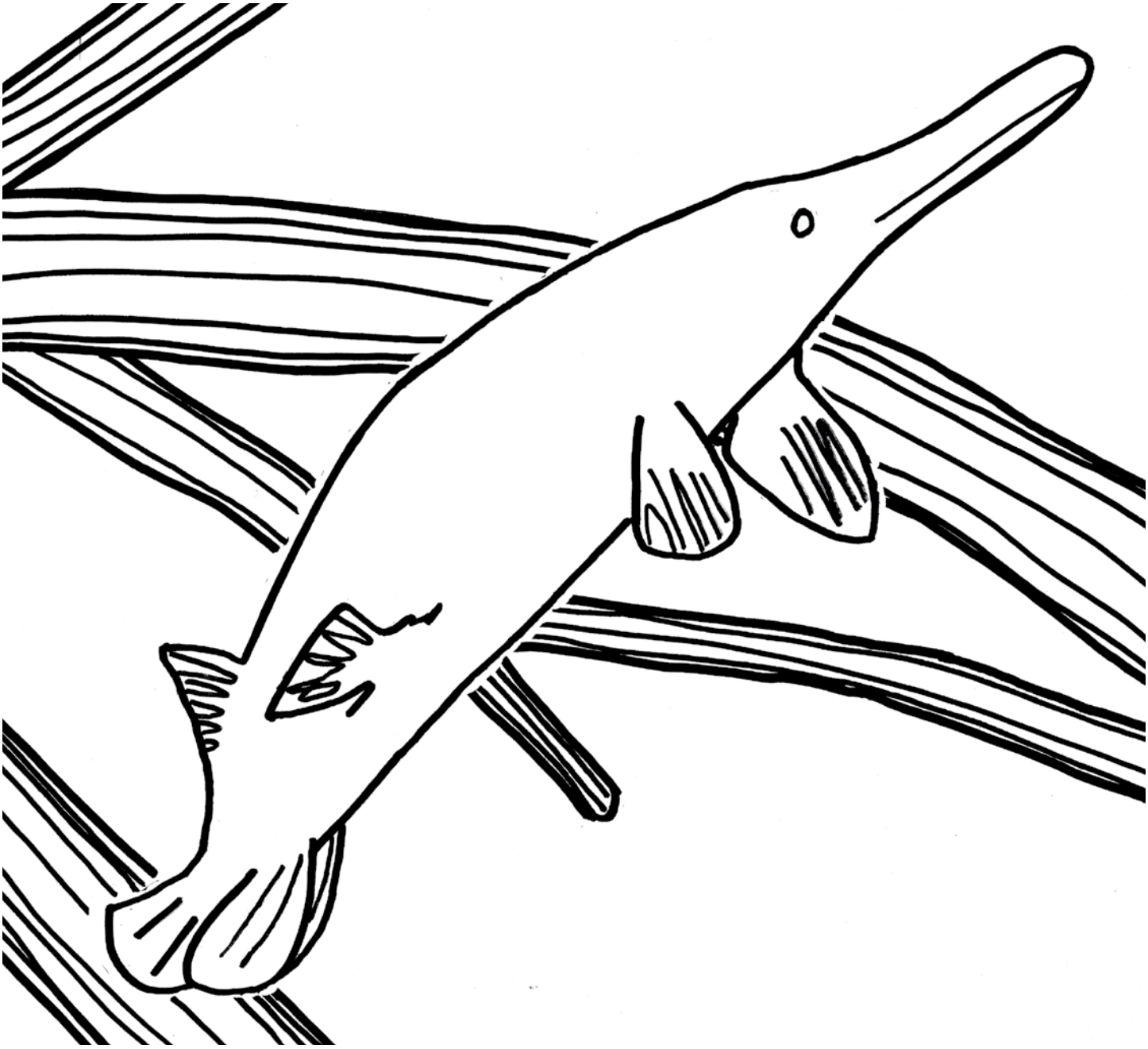
A Full Grown Carolina Pygmy





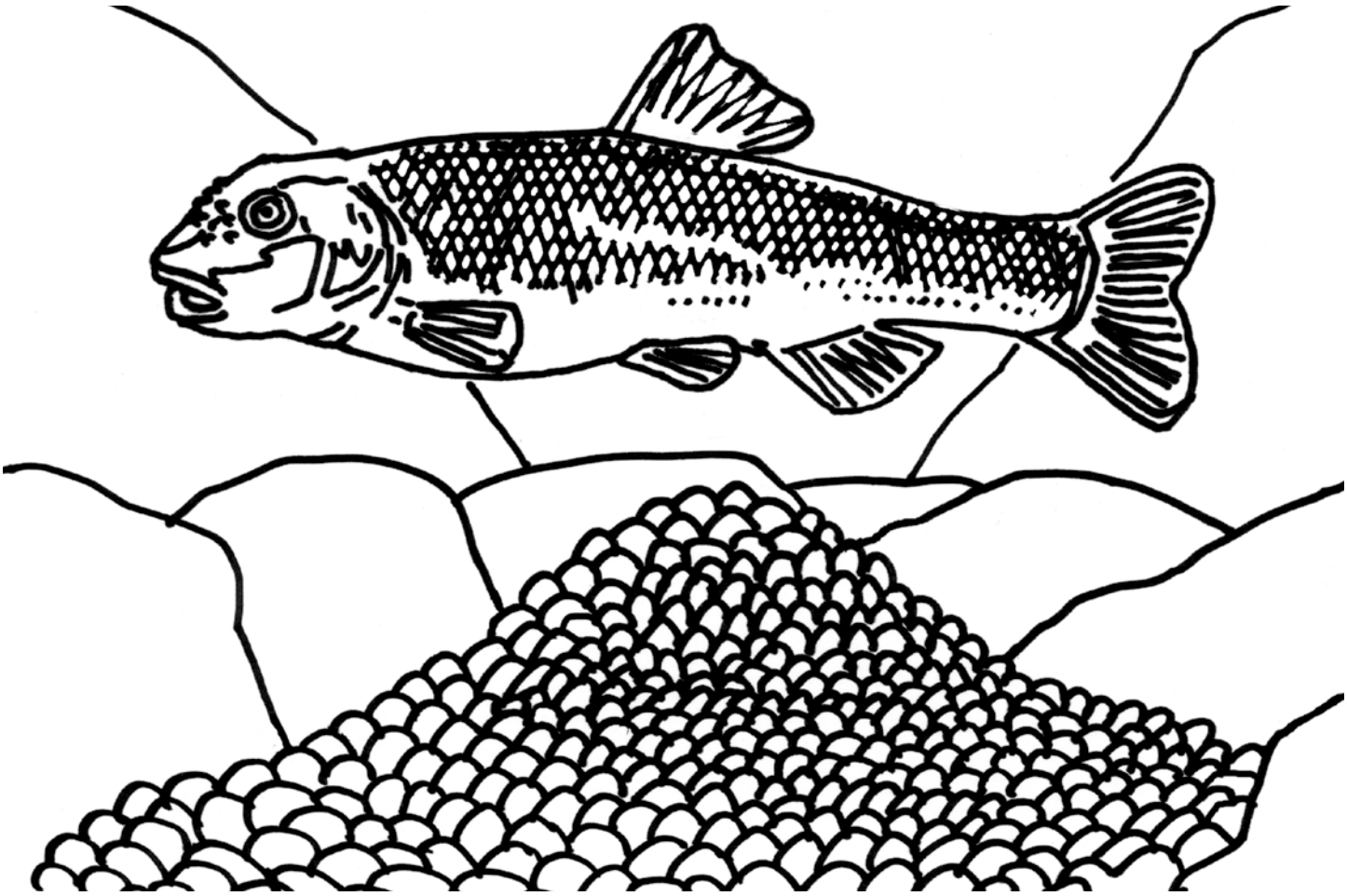
Christmas Darter

The **Christmas darter** is a very colorful fish. Both the male and female of this species are brightly colored. They have dark green bars on their side that are separated by a red bar in the males and a yellow bar in females. The Christmas darter is found only in South Carolina and Georgia. Currently, this species is considered to be at an abundance that is safe or stable; however, due to the limited amount of suitable habitat, their population may be affected easily by development, logging, sedimentation, drought and other factors.



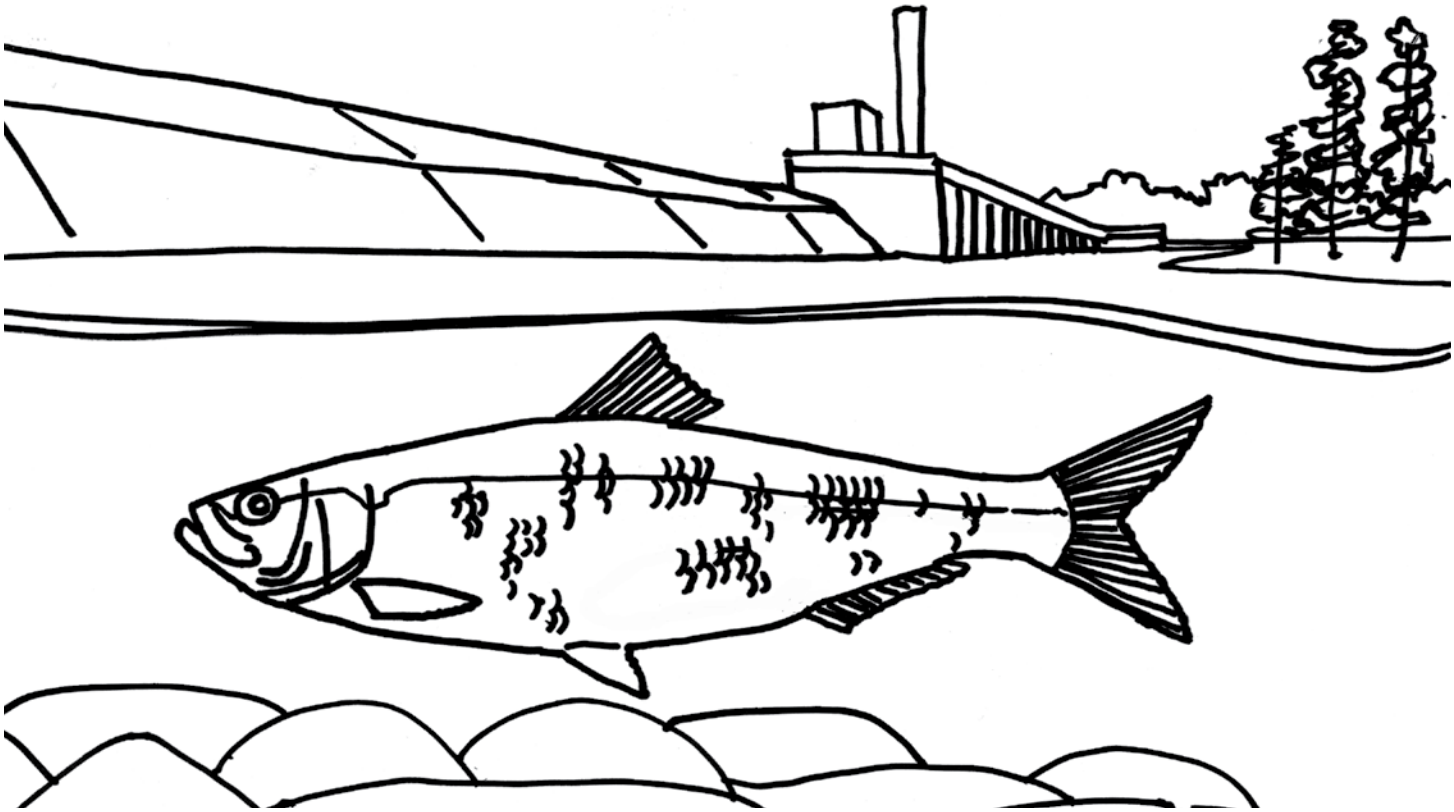
Florida Gar

The **Florida gar** is a member of a family of fishes that first appeared around 200 million years ago. The longnose gar is one other gar species found in South Carolina. The Florida gar has a broader and shorter snout than the longnose gar. Both gar species have a heavy armor of diamond-shaped scales and a long snout and mouth. Florida gars can reach lengths of up to 4 feet long. Due to its isolated population in the lower Savannah River, the Florida gar is very vulnerable to changes or alterations to its habitat.



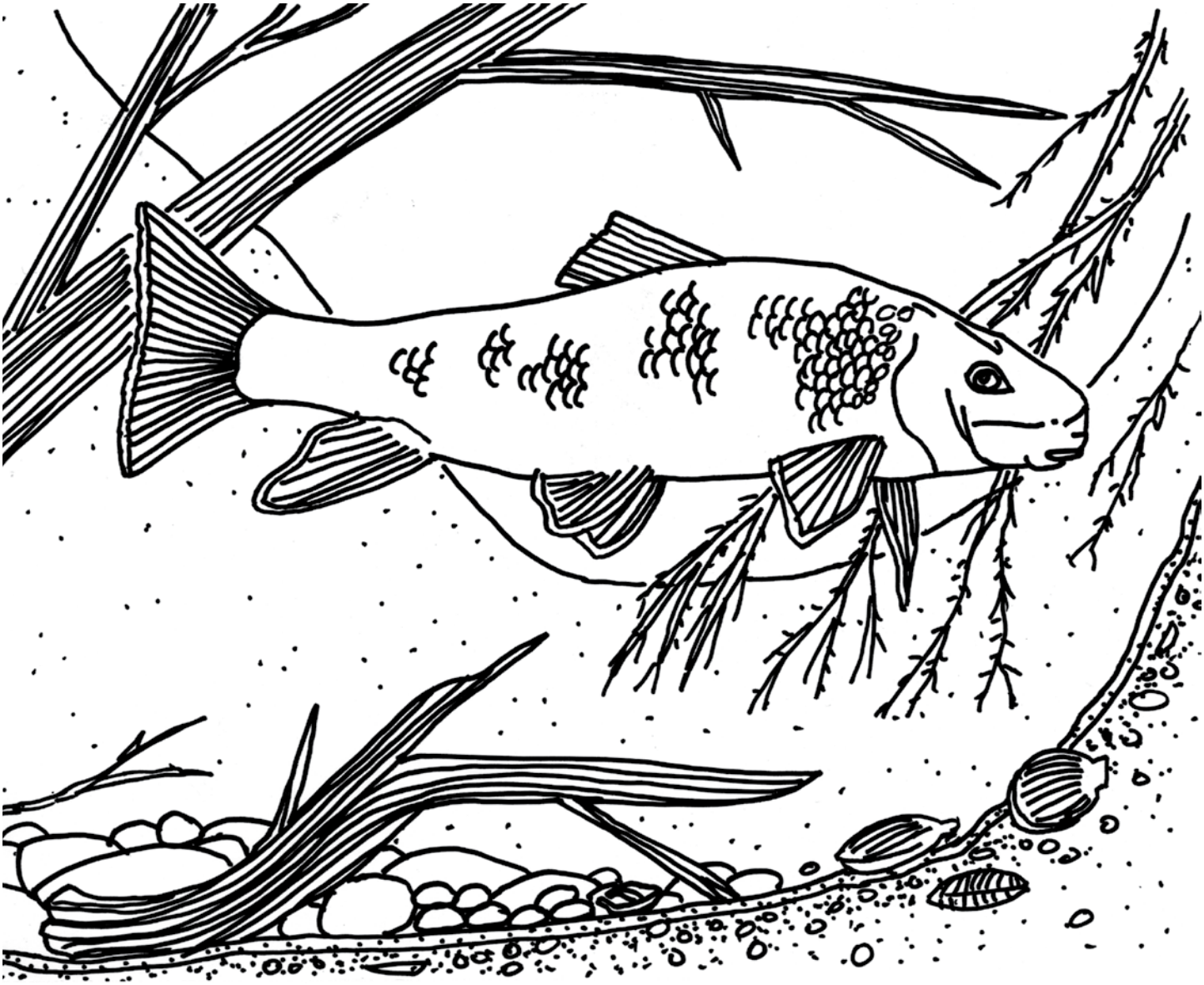
River Chub

River chubs are generally light in coloration except the males who can have blue-pink heads and red-orange fins when spawning. Males also have tubercles, little pimple-like bumps, located on their heads during spawning. River chubs are a **keystone species**, meaning that their very existence influences many other species in an aquatic **ecosystem** or environment. For example, river chubs build gravel nests for **spawning** or laying eggs. In turn, other species of fish such as shiners, will also use these nests for spawning. Sedimentation negatively impacts river chubs as it covers up the rocks the chubs need to build nests.



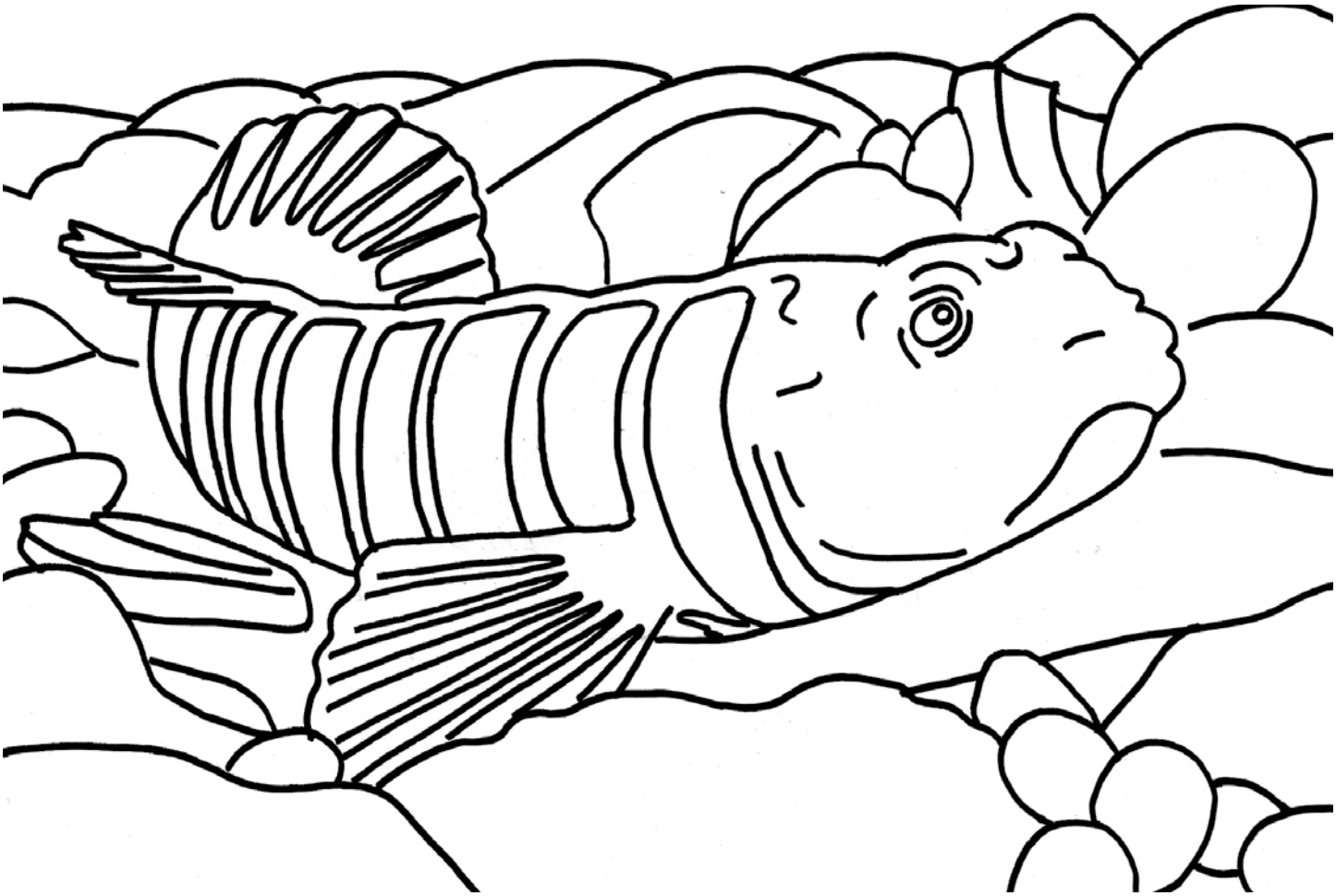
American Shad & Relatives

The **American shad** has a dark bluish, greenish or bronze color on the back with silver side and a white belly. American shad and its relatives, the hickory shad and blueback herring, all migrate each year from the ocean several hundred miles up large rivers to spawn. Therefore, the American shad, hickory shad and blueback herring are all anadromous. These fish are very important to the aquatic food webs in freshwater, estuarine, and marine habitats. An **aquatic food web** shows the feeding or eating relationships between species within an ecosystem. For example, shad eat organisms such as jellyfish, krill, and other small animals. Shad are then food or **prey** for other animals such as striped bass, American eels, sharks, tunas, mackerel, dolphins and porpoises. Migratory fishes like shad are also eaten or consumed by fish- eating birds like osprey and bald eagles. Decreasing numbers of shad can affect behaviors such as nesting of fish eating-birds or growth rate changes in fish that use shad for food. Compared to historic records, American shad, hickory shad and blueback herring are all experiencing a reduction or decrease in population numbers. Dams have created huge problems for shad and its relatives as well as all other migratory fish species. Shad need to travel upriver in order to spawn, but cannot reach suitable habitat because of dams. However, some dams provide fish passage devices such as fish ladders or lifts like the one in St. Stephen, SC. The fish passage devices allow for some fish to pass through, but many are confused by the unnatural flows that a hydroelectric dam creates and don't find the passage entrance. Concentrations of fish stopped at a dam are vulnerable to being eaten by large numbers of double-crested cormorants (fish-eating birds) and non-native fish species such as flathead and blue catfish that gather around the dam to feed. Sedimentation, pollution and changing water flows also cause problems for shad and its relatives.



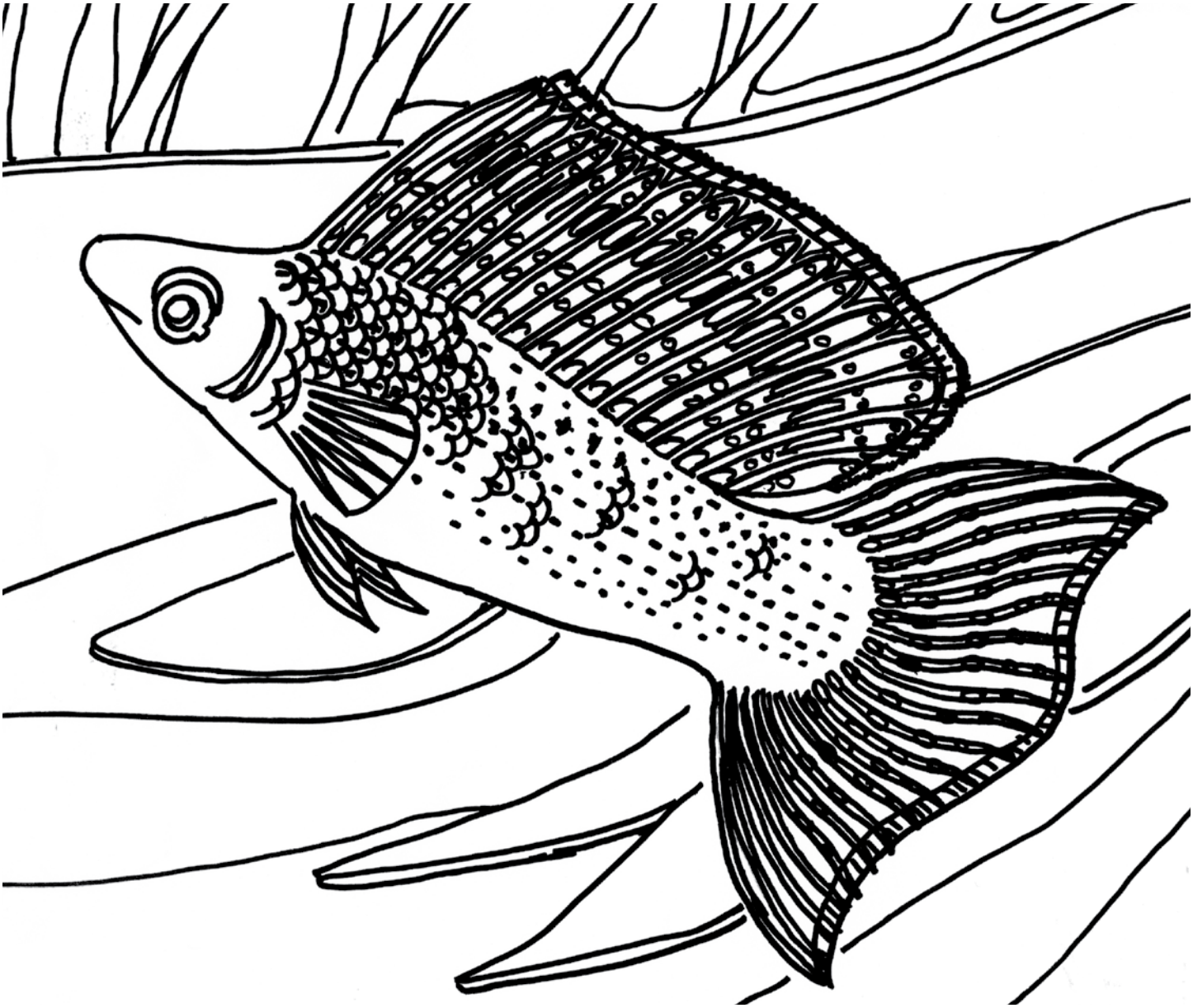
Robust Redhorse

The **robust redhorse** is a large sucker species that has large molar teeth like people have in the very back of their mouth. They use these molar-like teeth to crush food with hard bodies such as clams and mussels. The fish is bronze in color on the back and sides and when they are young or juveniles they have a red tail. The species is listed as threatened in Georgia, but it has no critical status in South Carolina or North Carolina. These three states are the only place in the world this fish occurs. Because of its limited distribution, the robust redhorse is affected by habitat loss, changes in water flow, dams, sedimentation and pollution. They also have to compete with non-native fish species such as flathead catfish and blue catfish for food. They have to worry about being eaten by these fish too!



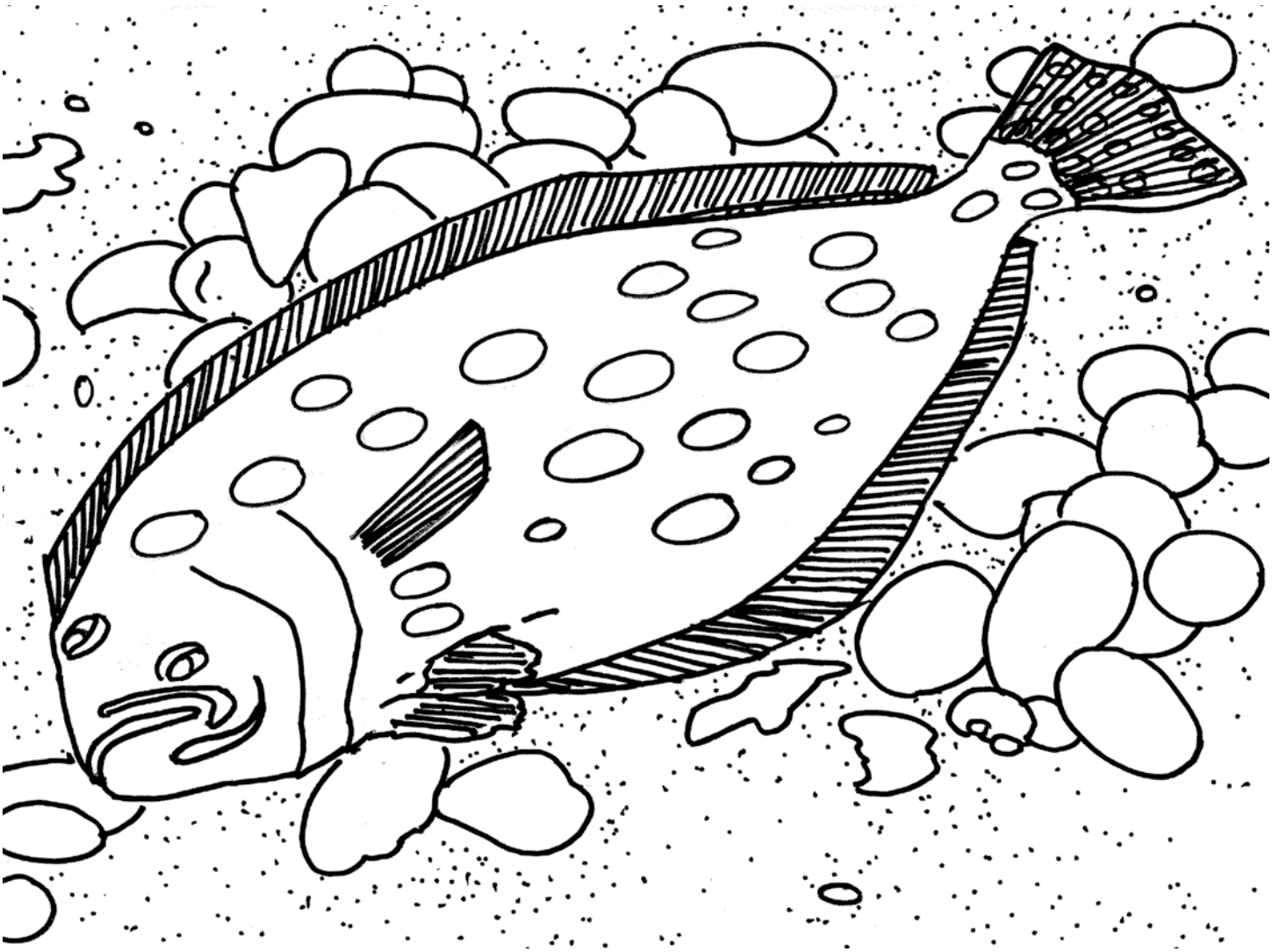
Naked Goby

The **naked goby** is a very small species of fish measuring about 2.5 inches long. It is very secretive and lives along the bottom around sunken logs or oyster reefs. Despite its small size, the naked goby is very important. It serves as an **indicator species** for estuarine habitats. An indicator species is a species whose success or failure within an ecosystem can show the health of the habitat. Naked gobies spawn, feed and find protection from **predators** (animals that are out to eat them) in oyster reefs. Since the naked goby depends on the oyster reef for every aspect of its life, they are indicators of health in the oyster reef habitat.



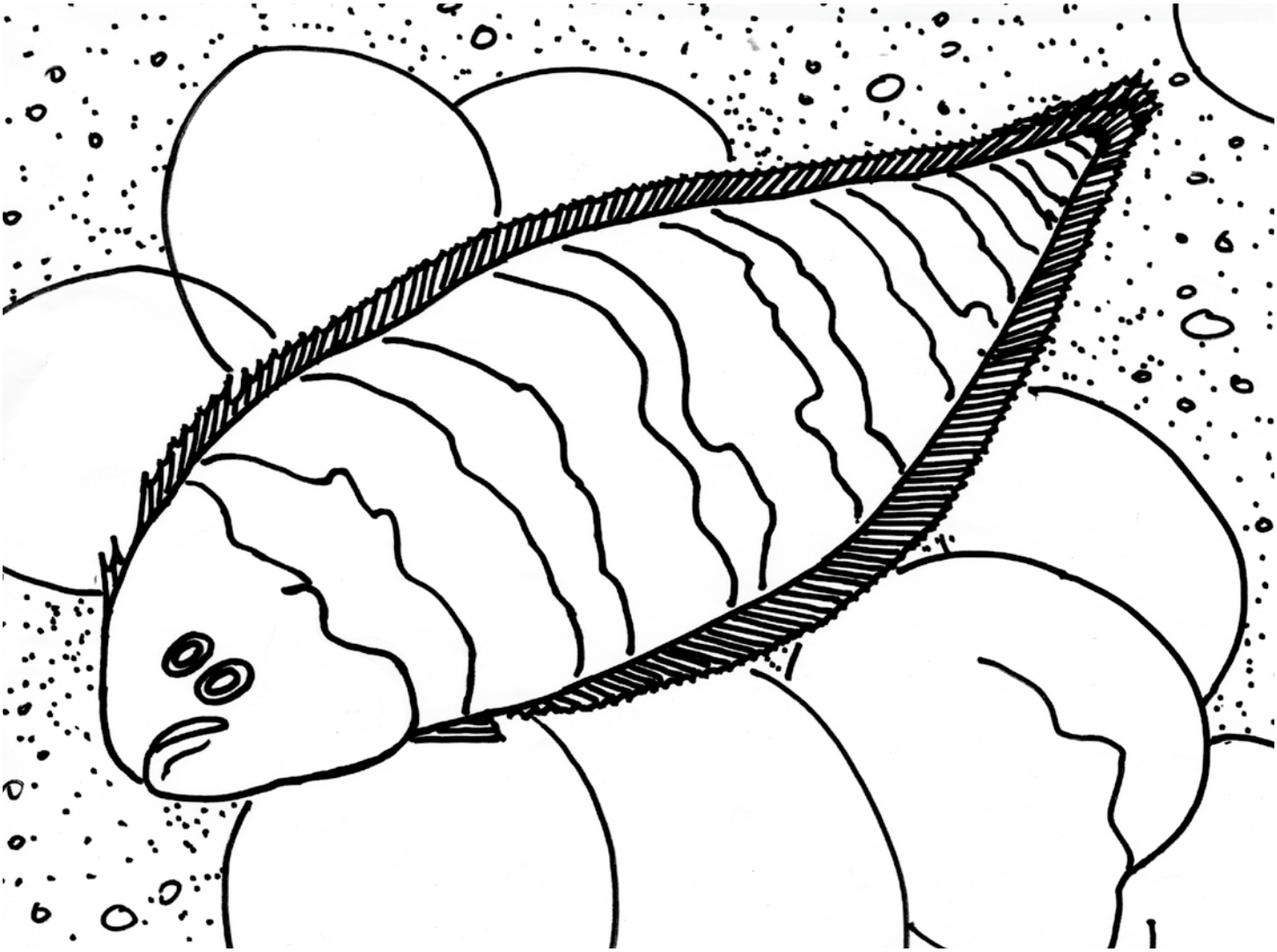
Sailfin Molly

The **sailfin molly** is in a unique group of fishes known as the livebearers. Many fish species produce their young or offspring by laying eggs; sailfin mollies do not. They give birth to live young producing up to 141 offspring. Sailfin mollies have a light gray to olive color along the sides with a lighter color belly. During spawning, males will have a more greenish-colored body with aqua and orange accents on the tail. Sailfin mollies feed mainly on algae but they will also eat small insects such as baby mosquitoes called mosquito larvae. Due to their tendency to feed on mosquito larvae, sailfin mollies and another livebearer, the eastern mosquitofish, are sometimes used to control mosquito populations.



Southern Flounder

The **Southern flounder** is a flat fish with both of its eyes on the topside of its body, making it a very unique fish. This body shape makes sense since flounder live on the bottom in estuarine habitats. However, when the flounder is young, it looks like a normal fish, having an eye on each side. As the fish grows to a certain stage, the eyes gradually shift to the same side of the head and the fish begins life as a bottom dwelling species. Southern flounder are a brown to light brown mottled color. They are a very popular recreational fishing species. As more people move to South Carolina's coast, flounder are fished more often, which may cause the population to decline because fewer of those fishes are getting the chance to reproduce. Flounder are also easily affected by chemical pollutants that settle into the sediment in which they feed and live.



Tonguefish

Tonguefishes look similar to the southern flounder in coloration and their bodies are flat with both eyes on one side. As you probably have already guessed, tonguefish also live on the bottom of estuarine habitat and the ocean. Although similar to the flounder in many ways, they are two separate species. Tonguefish are much smaller than flounder and are not a popular sport fish like flounder. No one goes fishing hoping to catch one, but they are commonly caught as bycatch in trawl fisheries. If you remember, you learned about trawling earlier, in the sampling methods section. Trawling is used often as a way to catch fish and shrimp commercially to sell in stores for people to eat. When commercial fishermen are out trawling, they are usually targeting certain types of species that are good for people to eat. While trying to catch these species, other unwanted or not kept species are caught in the net; this is called **bycatch**. Tonguefish are often injured or killed when caught as bycatch in trawls.

Word Find

Find and Circle all 19 words—horizontally, vertically, diagonally or backwards.

Habitat
Conservation
Dip Netting
Electroshocking
Seining
Trawling
Diversity
Species Richness
Sedimentation
Keystone Species
Spawning
Food Web or Food Chain
Ecosystem
Population
Species
Indicator Species
Predator
Prey
Bycatch

M I P T Q R I N G S T N C B E W X V Y W Q
V E N N A I R O L S C D N R A F F E J I P
C I T P P O S S E N H C I R S E I C E P S
A T Y S E L F O R S E T K G O I G H W E E
W E R C Y R F O O D W E B N C N V F S L D
S C R E E S M N T P Q A S I I F G I V E I
K J S P Q P O W A A S B D N L P T N K C M
T E W R R G N C D D T C I W D O E D A T E
U P B E S D I O E V V E A A G W T I A R N
V I Y E K I D N R W S F R P B L T C D O T
G M C L T V A S P E C I E S A R K A I S A
H N A I U E Y E W H U G A B T O P T P H T
J J T K V R T R A W L I N G D N A O N O I
O G C O N S A V S S X H O N K L P R E C O
P E H A B I T A T O P J B O U G H S T K N
R W U J A T A T F U M K D P O L E P T I T
E Q I B B Y L I K F N L O Q A K U E I N B
S X K E Y S T O N E S P E C I E S C N G S
A U B E M O E N L G T M D T E G S I G H E
Z E V T I C G J N W U N I U W B R E J K L
T D X V A K H I B B V S A V A D T S N O T

For ANSWERS see back inside cover.

Fishing for Meanings

1._____Habitat

2._____Conservation

3._____Dip Netting

4._____Electroshocking

5._____Seining

6._____Trawling

7._____Diversity

8._____Species Richness

9._____Sedimentation

10._____Keystone Species

11._____Spawning

12._____Food Web or Food Chain

13._____Ecosystem

14._____Population

15._____Species

16._____Indicator Species

17._____Predator

18._____Prey

19._____Bycatch

A. An area or environment in which a species lives

B. A particular type of plant or animal

C. A group of individuals of a particular species

D. An animal that is used as food for another animal

E. The process of depositing or laying eggs in water

F. Means to preserve, protect, or manage a species to prevent its disappearance

G. Means a lot of different species

H. Process by which biologists sample using net to run along the cracks and crevices in stream banks, along fallen trees, and aquatic vegetation

I. An animal that hunts and kills other animals for food

J. Shows the feeding or eating relationships between species within an ecosystem

K. Animals that are caught by accident while commercially fishing for certain species

L. Increased amounts of soil or sediments into water bodies by dredging, agriculture, or logging from nearby areas

M. Process by which biologists sample using a battery powered pack that sends an electric current through the water that stuns fish for a matter of seconds allowing them to be safely netted

N. Numbers of fish in a specific area

O. A species whose success or failure within an ecosystem can prove the health of the habitat

P. Process by which biologists use a long net to sweep across the bottom of a stream or lake in a horseshoe or half moon shape motion. The biologists will close the horseshoe or half moon catching fish along the bottom of the net

Q. An environment that contains the plants and animals working together in an area or habitat

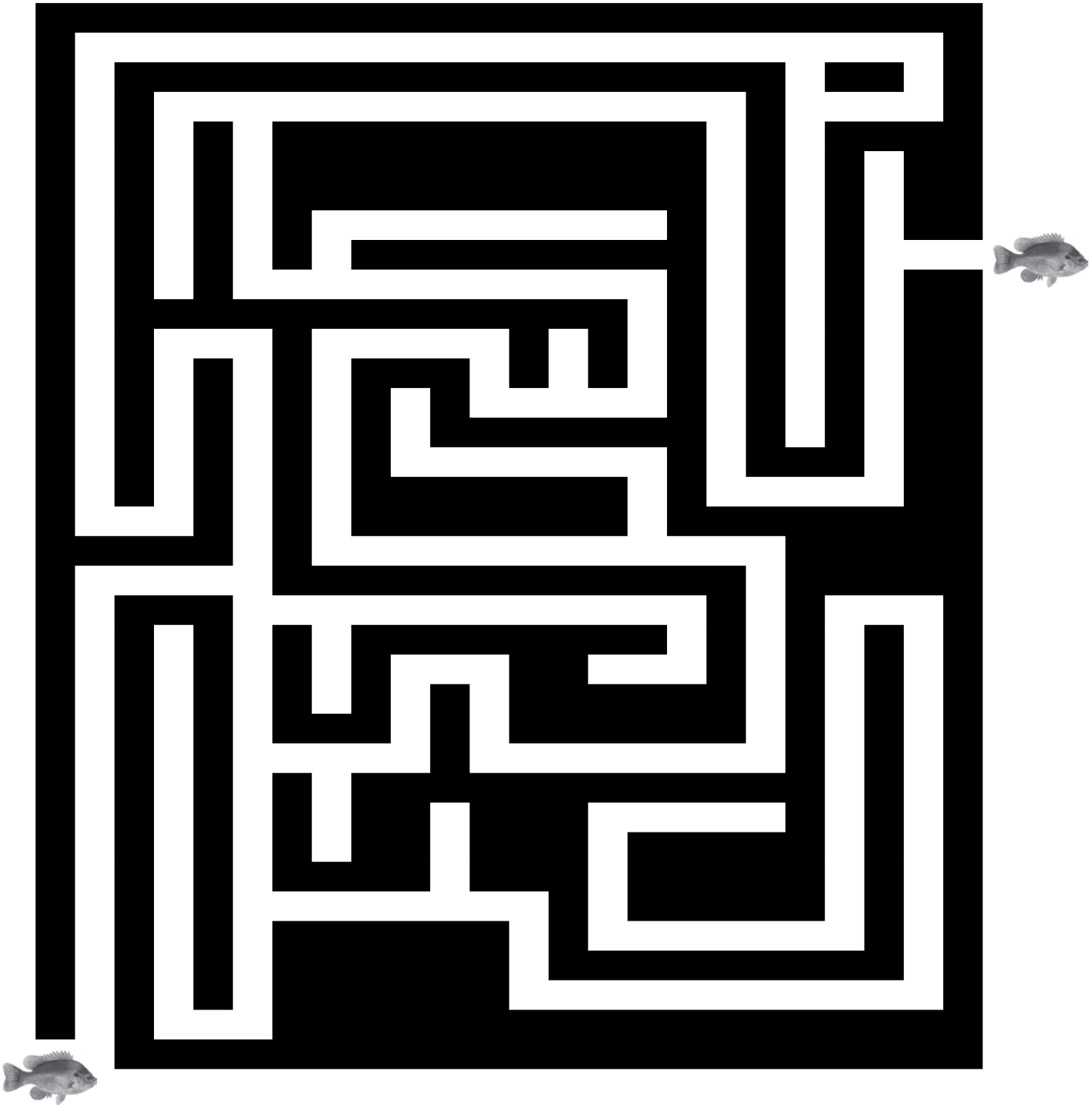
R. A species who influences many other species in an aquatic ecosystem or environment

S. Process by which biologists sample using a boat with a sock shaped net with a square or triangular opening. The net (the sock) is lowered into the water and then the boat moves forward at a very slow speed capturing anything in the net's path. The net is then pulled into the boat with the help of a pulley system for the biologists to observe its contents.

For ANSWERS see back inside cover.

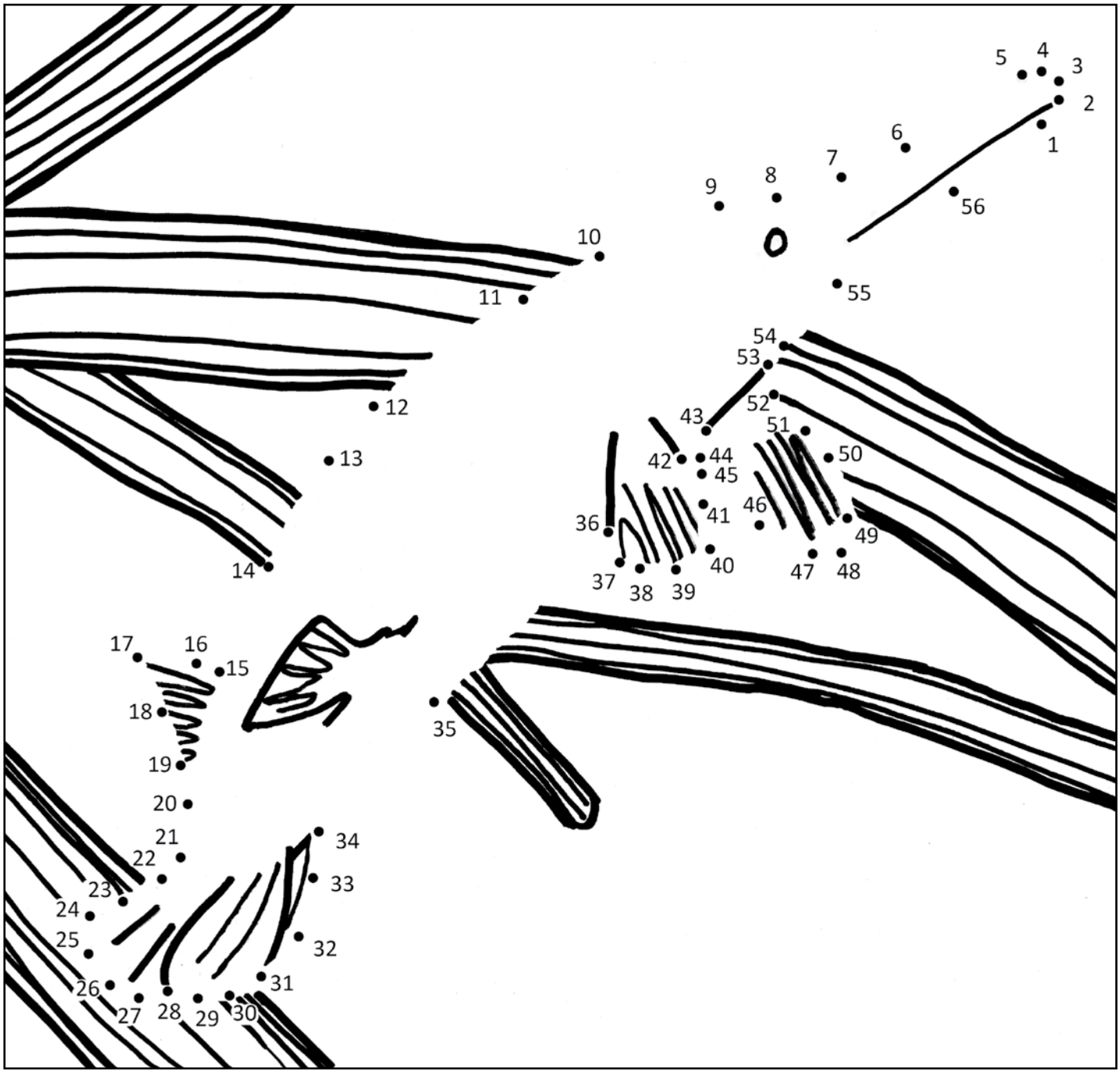
Fish Maze

Help the fish find their way upstream!



For ANSWERS see back inside cover.

Connect the Dots



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Ecosystem
Population
Species
Indicator Species
Predator
Prey
Bycatch

M	I	P	T	Q	R	I	N	G	S	T	N	C	B	E	W	X	V	Y	W	Q
V	E	N	N	A	I	R	O	L	S	C	D	N	R	A	F	F	E	J	I	P
C	I	T	P	P	O	S	S	E	N	H	C	I	R	S	E	I	C	E	P	S
A	T	Y	S	E	L	F	O	R	S	E	T	K	G	O	I	G	H	W	E	E
W	E	R	C	Y	R	F	O	O	D	W	E	B	N	C	N	V	F	S	L	D
S	C	R	E	E	S	M	N	T	P	Q	A	S	I	I	F	G	I	V	E	I
K	J	S	P	Q	P	O	W	A	A	S	B	D	N	L	P	T	N	K	C	M
T	E	W	R	R	G	N	C	D	D	T	C	I	W	D	O	E	D	A	T	E
U	P	B	E	S	D	I	O	E	V	V	E	A	A	G	W	T	I	A	R	N
V	I	Y	E	K	I	D	N	R	W	S	F	R	P	B	L	T	C	D	O	T
G	M	C	L	T	V	A	S	P	E	C	I	E	S	A	R	K	A	I	S	A
H	N	A	I	U	E	Y	E	W	H	U	G	A	B	T	O	P	T	P	H	T
J	J	T	K	V	R	T	R	A	W	L	I	N	G	D	N	A	O	N	O	I
O	G	C	O	N	S	A	V	S	S	X	H	O	N	K	L	P	R	E	C	O
P	E	H	A	B	I	T	A	T	O	P	J	B	O	U	G	H	S	T	K	N
R	W	U	J	A	T	A	T	F	U	M	K	D	P	O	L	E	P	T	I	T
E	Q	I	B	B	Y	L	I	K	F	N	L	O	Q	A	K	U	E	I	N	B
S	X	K	E	Y	S	T	O	N	E	S	P	E	C	I	E	S	C	N	G	S
A	U	B	E	M	O	E	N	L	G	T	M	D	T	E	G	S	I	G	H	E
Z	E	V	T	I	C	G	J	N	W	U	N	I	U	W	B	R	E	J	K	L
T	D	X	V	A	K	H	I	B	B	V	S	A	V	A	D	T	S	N	O	T

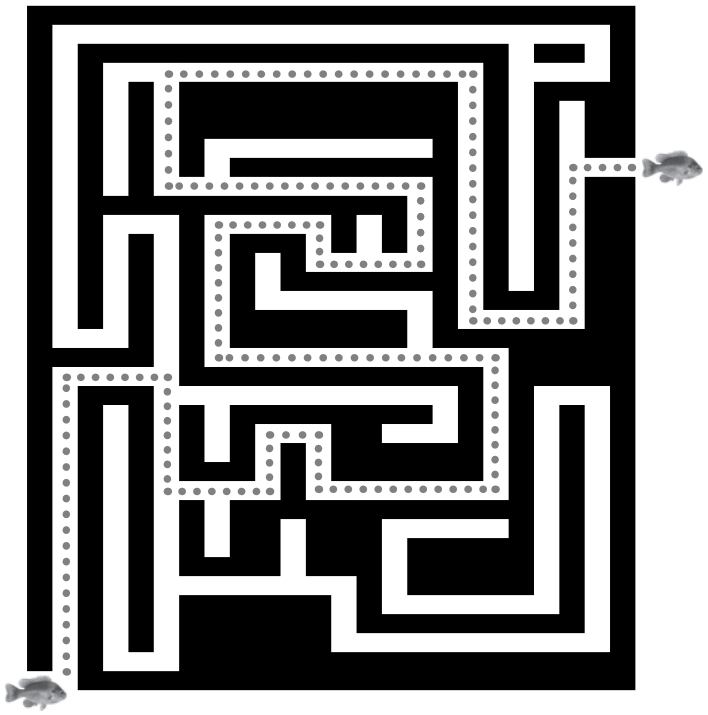
Fishing for Meanings

1. A Habitat
2. F Conservation
3. H Dip Netting
4. M Electroshocking
5. P Seining
6. S Trawling
7. G Diversity
8. N Species Richness
9. L Sedimentation
10. R Keystone Species
11. E Spawning
12. J Food Web or Food Chain
13. Q Ecosystem
14. C Population
15. B Species
16. O Indicator Species
17. I Predator
18. D Prey
19. K Bycatch

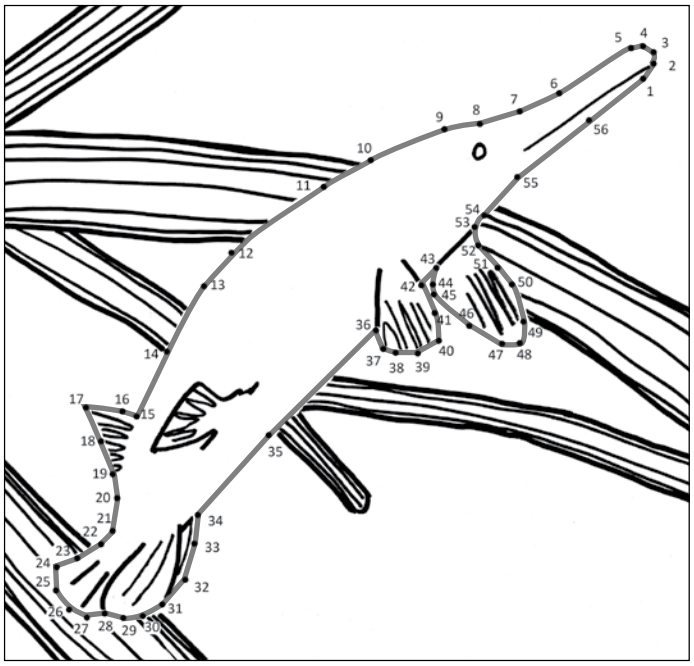
A. An area or environment in which a species lives
B. A particular type of plant or animal
C. A group of individuals of a particular species
D. An animal that is used as food for another animal
E. The process of depositing or laying eggs in water
F. Means to preserve, protect, or manage a species to prevent its disappearance
G. Means a lot of different species
H. Process by which biologists sample using net to run along the cracks and crevices in stream banks, along fallen trees, and aquatic vegetation
I. An animal that hunts and kills other animals for food
J. Shows the feeding or eating relationships between species within an ecosystem
K. Animals that are caught by accident while commercially fishing for certain species
L. Increased amounts of soil or sediments into water bodies by dredging, agriculture, or logging from nearby areas
M. Process by which biologists sample using a battery powered pack that sends an electric current through the water that stuns fish for a matter of seconds allowing them to be safely netted
N. Numbers of fish in a specific area
O. A species whose success or failure within an ecosystem can prove the health of the habitat
P. Process by which biologists use a long net to sweep across the bottom of a stream or lake in a horseshoe or half moon shape motion. The biologists will close the horseshoe or half moon catching fish along the bottom of the net
Q. An environment that contains the plants and animals working together in an area or habitat
R. A species who influences many other species in an aquatic ecosystem or environment
S. Process by which biologists sample using a boat with a sock shaped net with a square or triangular opening. The net (the sock) is lowered into the water and then the boat moves forward at a very slow speed capturing anything in the net's path. The net is then pulled into the boat with the help of a pulley system for the biologists to observe its contents.

Fish Maze

Help the fish find their way upstream!



Connect the Dots



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